

Applicant : Norman Margohus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 2 of 18

Attorney's Docket No.: 11656-002001

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

1. (Currently Amended) A method by which more than one client program connected to a network stores the same data item at the same location or locations in a data repository connected to the network, the method comprising:

~~having a first client program depositing a data item in a the data repository for a depositing client program,~~ the depositing including

determining a digital fingerprint from the data item using a ~~reproducible pseudorandom process~~ hash function that produces digital fingerprints having a pseudorandom distribution;

~~storing the data item in the data repository at a physical location or locations associated with the digital fingerprint,~~

~~having a second client program initiate a process for depositing a second data item in the data repository, the process including~~

~~determining a digital fingerprint from the second data item using the reproducible pseudorandom process;~~

comparing the determined digital fingerprint from the ~~second~~ deposited data item to digital fingerprints ~~for~~ of data items already stored in the data repository, and;

determining from the comparing of digital fingerprints, without comparing the entire contents of the ~~second~~ deposited data item to the entire contents of a data item already stored, whether a stored data item is identical to the ~~second~~ deposited data item ~~is already stored in the data repository;~~ and

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 3 of 18

Attorney's Docket No.: 11656-002001

storing the ~~second~~ deposited data item in the data repository if comparing establishes that ~~a data item identical to the second data item is not already stored in the data repository~~ there is no match, and not storing the ~~second~~ deposited data item in the data repository if comparing establishes that ~~a data item identical to the second data item is already stored in the data repository~~ a match is found;

associating the deposited data item with a named object, the associating including associating the deposited data item with an access authorization credential which is associated with the depositing client program;

associating the access authorization credential with the named object which comprises the determined fingerprint; and

storing the named object in a database;

retrieving the stored data item, in response to a request by a retrieving client program, the retrieving including

using the access authorization credential to select the stored named object;

retrieving the stored named object from the database; and

using the determined fingerprint from the retrieved named object to return the stored data item.

~~wherein the reproducible pseudorandom process produces a digital fingerprint designed to probabilistically guarantee to provide a unique digital fingerprint for every distinct data item sent to the data repository;~~

~~wherein the physical location or locations at which the deposited data items are is stored in the data repository are determined at least in part by the determined digital fingerprints.~~

2-3. (Canceled).

4. (Currently Amended) The method of claim 154 wherein the encrypting of the deposited data item is performed by the depositing client program ~~prior to transmitting the deposited data item to the data repository.~~

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 4 of 18

Attorney's Docket No.: 11656-002001

5. (Previously Presented) The method of claim 4 further comprising encrypting the key and storing the encrypted key in the data repository.

6. (Currently Amended) The method of claim 5 wherein a client or user specific key is used to encrypt the key derived from the content of the deposited data item.

7. (Currently Amended) The method of claim 154 wherein a plurality of client programs each deposit the same deposited data item and the key derived from the content of the deposited data item is the same for each depositing for all instances of the data item stored in the repository.

8. (Currently Amended) The method of claim 154 wherein users of the method are grouped into families, and the key derived from the content of the data item is the same for all instances depositings of the deposited data item stored in the repository by client programs acting on behalf of users in the same family, but may be different for users in different families.

9. (Currently Amended) The method of claim 1 wherein one or more additional copies or other forms of redundant information about the deposited data items ~~is~~ are stored in the data repository for data integrity, availability, or accessibility purposes and not to provide separate storage of the deposited data item for different client programs.

10. (Currently Amended) The method of claim 1 ~~further comprising associating the data item with each of a plurality of access authorization credentials, each of which is uniquely associated with a particular user or client program. wherein a plurality of client programs each deposit the deposited data item and the deposited data item is associated with a plurality of named objects.~~

11. (Canceled).

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 5 of 18

Attorney's Docket No.: 11656-002001

12. (Currently Amended) ~~The method of claim 10 wherein the associating of the data item with each of a plurality of access authorization credentials comprises storing a plurality of named objects, each named object comprising information representative of the data item paired with information representative of one of the access authorization credentials.~~ The method of claim 1 wherein the stored named object is identified by information representative of the access authorization credential.

13. (Canceled) .

14. (Original) The method of claim 12 wherein the information representative of the access-authorization credential is a cryptographic hash of all or part of the access-authorization credential.

15. (Original) The method of claim 14 wherein the cryptographic hash is an access identifier that uniquely identifies the data item for a particular user or client program.

16. (Currently Amended) The method of claim 12 wherein the named object is a data structure created by the client program.

17. (Currently Amended) The method of claim 12 wherein the named object is a data structure created by a server program acting on behalf of the repository.

18. (Currently Amended) The method of claim 12 further comprising a the depositing client replacing ~~an existing version of a~~ the stored named object with a new version of ~~that named object, by replacing the existing association with a data item stored in the data repository with a new association in which the determined fingerprint is replaced by a new fingerprint.~~

19. (Canceled).

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 6 of 18

Attorney's Docket No.: 11656-002001

20. (Currently Amended) The method of claim 12 wherein the stored named objects further comprises historical version information associating different data items deposited at different times with different versions of the named object versions, with the most recently created version being the current version.

21. (Previously Presented) The method of claim 20 wherein a backup of data items stored in the data repository is accomplished by preserving copies of the current versions of named objects in existence at the time of the backup.

22. (Currently Amended) The method of claim 1 wherein ~~records are kept of the association between data items and names in order to define named objects, and wherein data items recorded as being associated with data items that are associated with~~ named objects are not deleted from the repository, and wherein named objects are backed up by preserving copies of the named objects stored in the database records in existence at the time of the backup.

23. (Original) The method of claim 21 or 22 wherein a plurality of backups are made at spaced time intervals.

24. (Currently Amended) The method of claim 21 or 22 wherein the backup is accomplished by ~~declaring that after a prescribed moment in time a new version of each named object will be created the first time that a new data item is associated with it~~ retaining named object versions for named objects that were the current version at a prescribed moment in time and creating new object versions for named objects that are associated with new data items after the prescribed moment.

25. (Original) The method of claim 24 wherein the prescribed moment in time is determined separately for each named object.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 7 of 18

Attorney's Docket No.: 11656-002001

26. (Currently Amended) The method of claim 22 wherein named objects are preserved by creating a new version of each of a plurality of named objects each time that a new data item is associated with it.

27. (Original) The method of claim 26, wherein versions of named objects that are deemed unnecessary are deleted.

28. (Original) The method of claim 27, wherein the determination of which versions of a named object to delete is based in whole or in part on the times at which the versions were created, and the intervals between these times.

29. (Currently Amended) The method of claim 20 further comprising preparing a digital time stamp hash for each of a plurality of named objects to allow ~~a property~~ the existence and content of these named objects at a point in time to be proven at a later date.

30. (Currently Amended) The method of claim 29 wherein a random or other difficult to guess element is incorporated into the digital time stamp hash for each of the plurality of named objects, to prevent the ~~property~~ existence or content from being proven if this element is deleted.

31. (Currently Amended) The method of claim 12 further comprising determining that a the stored data item stored in the data repository is not ~~referenced by~~ associated with any named object, and reusing the storage space used ~~to store the unreferenced~~ by the stored data item.

32. (Currently Amended) The method of claim 12 further comprising altering one or more properties or parameters associated with ~~an~~ the access-authorization credential to change the access rights of a client or user to the deposited data item ~~referenced by that credential~~.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 8 of 18

Attorney's Docket No.: 11656-002001

33. (Currently Amended) The method of claim 1 further comprising a challenge step to ascertain that a the depositing client program has the full entirety of the data item being deposited.

34. (Currently Amended) The method of claim 33 wherein the challenge step comprises requiring that the depositing client program attempting to store a data item provide correct answers to inquiries as to the content of portions of the data item being deposited, or inquiries that require knowledge of this content.

35. (Original) The method of claim 34 wherein the data item content on which the challenge is based is selected with a degree of randomness.

36. (Currently Amended) The method of claim 1 wherein a plurality of depositors use a plurality of depositing client programs to store data items in the repository, and at least some of the plurality of depositors are required to provide user identification.

37. (Currently Amended) The method of claim 36 wherein rules for when a depositor must provide user identification are selected in order to discourage unlawful distribution of access to ~~the data item~~ a proprietary data item stored in the data repository.

38. (Currently Amended) The method of claim 37 wherein there is a greater degree of user identification or a higher likelihood that user identification will be required when the proprietary data item being stored deposited by the depositor has been indicated to be ~~shareable~~ with retrievable by a plurality of data repository users.

39. (Currently Amended) The method of claim 37 wherein the proprietary for a class of data items the items may only be ~~shared~~ retrieved by users other than the depositor if the depositor has provided adequate user identification.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 9 of 18

Attorney's Docket No.: 11656-002001

40. (Currently Amended) The method of claim ~~38 or 39~~ 1 wherein identity information about ~~the depositor~~ a data repository user associated with the depositing client program is made available to ~~anyone able to access the data item~~ the retrieving client program, to discourage unlawful sharing of proprietary information.

41. (Currently Amended) The method of claim 40 wherein the identity information is stored in an encrypted form that a plurality of retrieving client programs provided with the access authorization credential can all read, and no client program without the access authorization credential can read, ~~the depositor and users subsequently access the shared data item can both read.~~

42. (Currently Amended) The method of claim 41 wherein, without the access authorization credential, it ~~the repository~~ is not able possible to decrypt the identity information ~~about the depositor.~~

43. (Currently Amended) The method of claim 37 wherein the identity of some ~~users~~ depositors has not been well verified, ~~but~~ and restrictions are placed on sharing of data items deposited by such ~~poorly~~ unverified users.

44. (Currently Amended) The method of claim 43 further comprising limiting access to data items deposited by an ~~poorly~~ unverified user.

45. (Original) The method of claim 44 wherein the limited access is provided by limiting the aggregate bandwidth provided for such accesses.

46. (Original) The method of claim 44 wherein the limited access is provided by limiting the number of simultaneous accesses to the data items.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 10 of 18

Attorney's Docket No.: 11656-002001

47. (Currently Amended) The method of claim 1 wherein the depositing client program has a directory structure for ~~the~~ a plurality of data items, the ~~data items are~~ directory structure is stored in the data repository, and the directory structure ~~is not evident to maintainers of the repository cannot be discerned by examining data within the data repository without knowledge of associated access authorization credentials.~~

48. (Currently Amended) The method of claim 1 wherein the deposit client program ~~using the repository runs on a client machine and~~ is a mirroring program which determines which data items to deposit in the data repository, and wherein that determination is based at least in part on the result of a comparison of digital fingerprints establishing that certain data items are not already stored in the data repository.

49. (Currently Amended) The method of claim 48 wherein mirroring software is downloaded to the client machine using a bootstrap process, wherein a small bootstrap program is downloaded and executed, and the bootstrap program manages download and installation of a further portion of the mirroring software.

50. (Currently Amended) The method of claim 48 wherein the default for deciding what data ~~items~~ to mirror is to mirror all or substantially all data ~~items~~ residing on the client machine.

51. (Currently Amended) The method of claim 48 wherein the mirroring comprises making a determination of which data ~~items~~ needs to be transmitted to the repository, and wherein that determination is based primarily on a comparison of digital fingerprints for data items at the client machine and data items in the repository.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 11 of 18

Attorney's Docket No.: 11656-002001

52. (Currently Amended) The method of claim 10 wherein the access-authorization credential is determined in part by computing a hash involving elements of the pathname for a file on ~~the~~ a client computer on which the depositing client program runs.

53. (Currently Amended) The method of claim 52 wherein the path name hash is made unique to ~~a~~ the depositing client program by introducing a reproducible but randomly chosen element into it.

54. (Currently Amended) The method of claim 12 wherein ~~a data-item~~ string of bytes is represented as a composite data item comprising a plurality of component data-items, and each of the plurality of component data-items are ~~is~~ separately deposited in the repository and the entire plurality is associated with the stored named object.

55. (Currently Amended) The method of claim 54 wherein ~~a~~ lists of fingerprints for data- items making up a composite data-item are deposited as an index data item, which can be ~~given~~ associated with a named object ~~name~~ and used for obtaining access to any of the component data-items.

56. (Currently Amended) The method of claim 55 wherein a proof-of-deposit is returned for ~~each component~~ the deposit of each of the plurality of component data items, and some or all of the proofs are presented when the index data item is ~~given an~~ associated with a named object- ~~name.~~

57. (Currently Amended) The method of claim 56 wherein, when transmitting ~~a~~ the composite data-item, the client uses fingerprints to avoid retransmitting components following loss of communication.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 12 of 18

Attorney's Docket No.: 11656-002001

58. (Original) The method of claim 57 wherein the index data-item is encrypted with a key that is only made available to the repository at the moment of access.

59. (Original) The method of claim 55 wherein an email message is broken up into component items in such a manner that the individual attachments are separate component data-items.

60. (Currently Amended) The method of claim 15 wherein the data repository comprises the database and the physical locations at which information about the named-objects is stored ~~is~~ are based on the access identifiers, to introduce reproducible pseudorandomness into the physical locations of the named-object data.

61. (Canceled).

62. (Currently Amended) The method of claim 1 wherein an access identifier is formed to provide proof of ownership of the deposited data item ~~stored in the repository, and~~ the access identifier is formed by producing a one-way hash including item-identifying information chosen by the depositing client program to identify the data item, ~~and the one-way hash cannot be reversed to permit the repository to discover the identity of the client program or user.~~

63. (Previously Presented) The method of claim 62 wherein the item-identifying information is associated with the client.

64. (Original) The method of claim 63 wherein the item-identifying information is derived at least in part from the path name of the data item on the client.

65. (Original) The method of claim 62 wherein user-identifying information is provided to the repository as part of the access-authorization credential.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 13 of 18

Attorney's Docket No.: 11656-002001

66. (Currently Amended) The method of claim ~~65~~ 1 wherein at least some of a plurality of access-authorization credentials can be transferred between users retrieving clients without ~~the use of communicating with~~ the repository.

67. (Currently Amended) The method of claim ~~65~~ 1 wherein at least some of a plurality of one class of users is not permitted to transfer access using access-authorization credentials can only be used by retrieving client programs associated with a single user.

68-153. (Canceled).

154. (Currently Amended) The method of claim 1 wherein the depositing further comprises encrypting the deposited data item using a key derived from the content of the deposited data item.

155. (Currently Amended) The method of claim 1, 9, 10, ~~11~~, 22, 33, 36, 47, 48 or 62 further comprising encrypting the deposited data item using a key derived from the content of the data item.

156. (Currently Amended) The method of claim 1 wherein the deposited data items are is all or a portion of a widely circulated non- electronic media medium such as a books or musical recording, and the method further comprises

converting the widely circulated non-electronic ~~media~~ medium to a standardized electronic version;

storing the standardized electronic version ~~as a data item~~ in the data repository;

~~promoting the availability of~~ providing access to the standardized electronic version to data repository users with who have the legal right to have access, whereby the likelihood of the data repository storing multiple, slightly-different electronic versions of the non-electronic ~~media~~ medium is reduced.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 14 of 18

Attorney's Docket No.: 11656-002001

157. (Previously Presented) The method of claim 48 wherein the aforesaid steps of the method provide a mirroring capability for a personal computer, and mirroring software with instructions for carrying out the aforesaid steps is preconfigured on the personal computer upon purchase.

158. (Previously Presented) The method of claim 48 wherein the aforesaid steps of the method provide a mirroring capability for a personal computer, and mirroring software for carrying out the method is initially configured to mirror essentially all data on the user's computer.

159. (Previously Presented) The method of claim 48 wherein the aforesaid steps of the method provide a mirroring capability for a wireless network device.

160-174. (Canceled).

175. (Previously Presented) The method of claim 1 in which different physical locations comprise different hard disk drives.

176. (Previously Presented) The method of claim 1 in which different physical locations comprise different data servers.

177. (Previously Presented) The method of claim 1 wherein the physical locations each comprise one or more different processors.

178. (Previously Presented) The method of claim 1 wherein the physical locations comprise physical storage nodes linked by a network.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 15 of 18

Attorney's Docket No.: 11656-002001

179. (Previously Presented) The method of claim 1 wherein determining from the ~~digital fingerprint~~ comparing of digital fingerprints, without comparing the entire contents of the deposited data item to the entire contents of a data item already stored, whether a stored data item is identical to the second deposited data item is already stored in the data repository comprises transmitting over the network the digital fingerprint of the ~~second deposited~~ second deposited data item rather than the ~~second deposited~~ second deposited data item itself.

180. (Currently Amended) The method of claim 1 wherein there is a first depositing client program and a second depositing client program and the first and second client programs are independent programs.

181. (Previously Presented) The method of claim 180 wherein the independent programs are running on separate computers.

182. (Currently Amended) The method of claim 1 wherein there is a first depositing client program and a second depositing client program and the first and second client programs are the same program running at different times.

183. (Currently Amended) The method of claim 1 wherein ~~at least the first~~ the depositing client program comprises a file server.

184. (Previously Presented) The method of claim 1 wherein files and directories are named objects within the data repository.

185. (Previously Presented) The method of claim 1 wherein a structured item is split up into a plurality of data items with the divisions occurring at content dependent boundaries.

Applicant : Norman Margolus et al,
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 16 of 18

Attorney's Docket No.: 11656-002001

186. (Previously Presented) The method of claim 185 wherein the structured data item comprises an e-mail message and the content dependent boundaries are the divisions between email attachments.

187. (Currently Amended) The method of claim 1 wherein a plurality of depositing clients programs each of which has initiated a process to deposit an identical the deposited data item and a corresponding plurality of retrieval client programs all share read access to a single repository the stored data-item.

188. (Currently Amended) The method of claim 187 wherein retrieval clients programs which have not initiated a process for depositing the identical data item do not possess an access authorization credential generated during deposit of the deposited data item cannot read the stored data item.

189. (Currently Amended) The method of claim 187 wherein a reference count that reflects the number of times the data item has been associated with named objects clients that share read access to the single repository data item has transitioned to zero and the storage space associated with the shared repository stored data-item is reclaimed.

190. (New) The method of claim 1 wherein the data repository comprises the database.

191. (New) The method of claim 1 wherein the depositing client program and the retrieving client program are the same program.

192. (New) The method of claim 1 wherein the depositing client program deposits the deposited data item twice and the deposited data item is associated with two distinct named objects.

Applicant : Norman Margolus et al.
Serial No. : 09/785,535
Filed : February 16, 2001
Page : 17 of 18

Attorney's Docket No.: 11656-002001

193. (New) The method of claim 1 wherein a group of data items are stored in the data repository and the entire group is associated with the stored named object.

194. (New) The method of claim 1 wherein there exists a defined protocol used by data repository client programs to communicate with the data repository and the defined protocol allows data repository clients to deposit data items without storing them if they are already stored in the data repository and only allows data repository clients to retrieve data items indirectly, by using access authorization credentials to select named objects.